

Growing Oregon's Innovation Economy Through Postsecondary Education



Academic Excellence and Economic Development Working Group

AEED Principles in Practice

July 2005

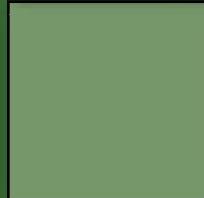
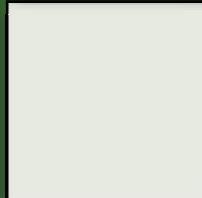
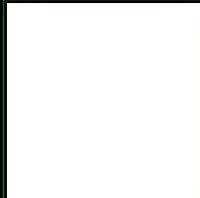
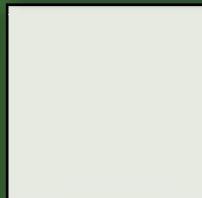
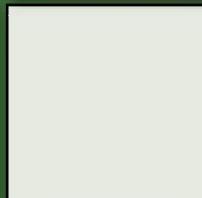
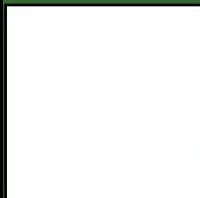


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Mission & Goal

The focus of the Academic Excellence and Economic Development (AEED) Working Group of the Oregon State Board of Higher Education is the intersection of areas of excellence in our postsecondary education institutions with existing or new economic forces driving business innovation and initiatives in Oregon.

The AEED's specific goal is to identify and gain support for 2-5 economic development opportunity areas that—

- Show a measurable return on investment over 20 years, with interim results at earlier intervals;
- Collectively touch every part of Oregon;
- Build on existing or emerging momentum;
- Draw on and reinforce excellence in academic programs; and
- Offer opportunities that are exciting and easy to conceptualize.

Growing Oregon's Innovation Economy Through Postsecondary Education

AEED Principles in Practice

Interdisciplinary innovations, collaboration and partnerships, integrated facilities, barrier removal...

The nearly eighteen months of discussion and deliberation by members of the Academic Excellence and Economic Development Working Group identified not only a set of promising opportunity areas to pursue, but also underscored several principles key to the successful development of these opportunity areas. Across the Oregon University System (OUS), and in other postsecondary education institutions and public agencies, these principles are already in practice. This booklet offers just a few examples.

Innovation often occurs at the interfaces between disciplines. Several of the opportunity areas selected by AEED for further development and support—in particular, nanotechnology, neurosciences and biomedical research, natural resources, and sustainability—have reaped unanticipated benefits from discoveries occurring when diverse disciplinary perspectives and methodologies are applied to an area. The work of the **University of Oregon** (UO) and **Oregon Health and Science University** (OHSU) in the field of neuroscience is an example of how cross-disciplinary work within campuses and development of an important research tool for use across universities can lead to national prominence and commercial success.

Collaboration—across departments, institutions, and sectors—builds the foundation for economic and community vitality. Two of the selected opportunity areas—healthcare workforce and

education—address important community infrastructure issues essential for economic development.

Oregon Institute of Technology's partnerships in providing critical healthcare professional preparation are highlighted here as one example. A proposed “virtual” center for educational research, which would serve as an important resource for policymakers and practitioners, provides another example. The Teaching Research Institute at **Western Oregon University** will be a key element of that center.

Integrated facilities design fosters a culture of inquiry, collaboration, and innovation. We offer the example of **Eastern Oregon University's** new science center, supporting multi-university and cross-sector research, which provides a home not only for faculty and professional research staff, but also supports another AEED principle: providing critical research experience for undergraduates.

Cutting-edge research takes place at all universities, not just the designated research universities. Although Oregon State University (OSU), Portland State University (PSU), the UO, and OHSU are explicitly designated as “research universities” and have mature research programs, that does not mean that important cutting-edge work takes place solely at those institutions. Professor Greg Jones’ work at **Southern Oregon University** provides an example of leading work in the fields of climatology and viticulture, bringing international recognition and valuable regional and state economic benefits.

Members

The marriage of natural resources and nanotechnology offers an exciting opportunity for Oregon to establish its premier status in the area of sustainability. Oregon has developed significant research strength in the nanoscience area, expressed in the formation of the Oregon Nanoscience and Microtechnologies Institute (ONAMI). Applying this technology to Oregon's traditional strengths in the natural resources area can propel Oregon into national and international prominence, especially through innovations in sustainability. Research conducted at **Oregon State University** on the production of biodiesel fuel is an example of the potential for this marriage of research areas.

Removing barriers in bringing research discoveries and innovation to market means bridging the “valley of death.” Taking a new discovery, technology, or application from concept to proof-of-concept is hampered by the lack of seed funding (pre angel and venture capital funding) and an early connection to business and marketing expertise. **Portland State University’s** Lab2Market initiative shows one way our universities can help to address this problem.

The opportunities before us are exciting and show great promise for Oregon. The examples in this booklet demonstrate that they can be accomplished. All that is needed now is the commitment to nurture them to success.

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Neuroscience Collaboration Fosters Innovation

Interinstitutional and interdisciplinary collaboration furthers brain research

A tradition of interinstitutional and interdisciplinary collaborations has made Oregon one of the top states in neuroscience research. One of the best examples is the internationally renowned, NIH-funded *Zebrafish International Resource Center and Information Network* (ZIRC and ZFIN) under the leadership of Monte Westerfield, an outgrowth of University of Oregon research spanning several decades. The use of the zebrafish was pioneered by George Streisinger at the UO as a vertebrate model system for genetic research. The extraordinary value of ZIRC and ZFIN to a wide range of molecular biology and neuroscience researchers has helped to maintain UO at the forefront of these fields and has sparked additional efforts at Oregon Health & Science University. New enterprises—for example *Znomatics Inc.* founded by OHSU scientists Roger Cone and Wenbiao Chen in 2001—underscore the importance to Oregon of having a key research tool.

Interdisciplinary collaborations within a university are also critical for innovation. A major example is UO's *Brain Biology and Machine Initiative* (BBMI) that has received about \$25 million in private gifts and Congressional Interest Project funds since 2000. The BBMI includes core faculty in biology, chemistry, computer science, and psychology, and involves the Institute of Molecular Biology, Institute of Neuroscience, Neuroinformatics Center, and the Lewis Center for Neuroimaging. The goal of the BBMI is to better understand how the human brain and mind function through research integrating cognitive psychology, molecular genetics, animal models, advanced computation, and functional magnetic resonance imaging.

The UO is developing a transgenic mouse facility to probe the linkages between genetics and behavior that is modeled on the success of its Zebrafish International Resource Center. In the next stage,



the BBMI will link leading College of Education researchers to pursue improvements in educational approaches based upon fundamental scientific knowledge of brain development and associated learning processes. In addition, there are various interinstitutional efforts involving the BBMI such as OHSU collaborations supporting "Brain and Education" workshops for educators.

UO brain research reaches out into the larger community through the creation of new companies. Don Tucker, a UO psychology professor, started *Electrical Geodesics, Inc.* (EGI) to enable the development and worldwide distribution of brain-mapping technologies for research and clinical applications. Housed in the Riverfront Research Park (RRP) in Eugene, EGI currently employs about 40 staff. A spin-off from BBMI and EGI, called *Cerebral Data Systems*, was created in 2005 in the RRP to assist with the development of telemedicine applications for brain injury, epilepsy and stroke. Based on research done in association with the Institute of Molecular Biology and the Monoclonal Antibody Facility, UO researchers Rod Capaldi and Mike Marusich recently launched a RRP start-up company, *MitoSciences LLC*. Studies of the energy production processes in cells are leading to emergent diagnostic and clinical tools for a variety of disorders, including neurological diseases such as Parkinson's or Alzheimer's disease.

Cross-Sector Partnerships In Healthcare Education

A Klamath Falls student benefits from KCC, OIT, & OHSU partnerships

Gretchen Claypool graduated in nursing from Oregon Health & Science University (OHSU) in June. At age 38, she was one the many returning adult students across the state who benefited from collaborative community college/university and distance learning programs. With access to healthcare training in rural areas, students like Gretchen are able to stay and help address shortage areas in their own communities.

Married with three sons, Gretchen practiced massage therapy before returning to college and says that, "I had a couple of clients who wanted me to do massage for childbirth labor and delivery, and I simply fell in love with that process." She planned to study midwifery, but was so impressed by her nursing coursework and clinical experience that she switched gears and decided to go into labor and delivery nursing.

Gretchen started her general education coursework at Klamath Community College, and transferred to Oregon Institute of Technology (OIT) where she was granted the Dean's Gold Scholarship to continue her nursing program prerequisites. She transferred into the OHSU nursing program at OIT for her last two years of study. Gretchen loved her clinical rotation practice this spring, and feels she has acquired a well-rounded clinical experience.

All but her clinical coursework was video-broadcast from OHSU in Portland or from Southern Oregon University, with up to 75 students in the on-site classroom and 18 in the remote classroom. While there were challenges in completing her coursework through distance learning, she acknowledges what a great benefit the OHSU at OIT program has been. "It allowed me to finish my degree while staying home. Had it not been



for that, I probably would not have been able to finish the program."

After her board exams and graduation, Gretchen will continue to train in the medical industry. The very same week she graduated, she interviewed at Merle West Medical Center in Klamath Falls. Gretchen will participate in a six-month paid graduate training program at the center, which includes five weeks of training with a preceptor in every area of the hospital, followed by eight weeks of intensive training in medical research. Finally, she will be able to train anywhere in the hospital and apply for any opening, confident in her skills. "It says a lot about the facility that the nursing staff is so well trained and well oriented."

Gretchen pursued a nursing career because she knew firmly that "this is where I want to be in life."

New Science Facility Promotes Research Opportunities

A student excels in undergraduate research at EOU's new Science Center



Calvin Davis is just one of many undergraduate students across the Oregon University System who have discovered the rich academic benefit of participating in advanced undergraduate research. He is also benefiting

from the collaborative programs and cutting edge instrumentation housed in the new Eastern Oregon University (EOU) Science Center facility. Calvin graduated this June from EOU with a major in Chemistry, a minor in Geology, and extensive undergraduate research experience that gives him a leg up in the job market of environmental and agricultural science.

Calvin started out his science courses in EOU's old Badgley Hall, and finished his coursework at the new EOU Science Center, which he describes as "ten times better." Open to students in the fall of 2004, the new EOU Science Center, a 67,000 square foot addition to and renovation of Badgley, is a unique facility that brings the scientific research arm of agencies into the academic environment, and gives students a practical hands-on approach to learning, research, and solving natural resource issues for Oregon. This integrated facility houses EOU programs in biology,

chemistry, geology, physics, and psychology. The Oregon Department of Fish and Wildlife, including the Confederated Tribes of the Umatilla Indian Reservation Natural Resource Fish Pathology Lab, also locate their research in the center, providing active learning opportunities for students. The addition includes twenty-seven high-tech labs, a large greenhouse, classrooms, a 7,500 square foot biotech lab, and a 150-seat lecture hall.

Though just opened in 2004, the Center is already abuzz with activity affecting the students and the region. Calvin says that the science department's instrumentation, including several pieces of technologically advanced chemistry



instruments, has been a tremendous benefit to his educational experience. "The curriculum is definitely adapting to involve the instrumentation, and the labs are changing so that students get a better introduction to the field."

The benefit of the facility extends beyond campus borders. With financing from a combination of



federal, state, and private sources, EOU partnered with Oregon Health and Science University in nursing, Oregon State University in rangeland resources and agricultural business, and Portland State University in engineering, as well as the Oregon Department of Fish and Wildlife, in the construction of the center. OHSU also provided funding for construction of the biotech lab, offering economic development opportunities for Northeast Oregon, and feeding new discoveries to businesses. In March 2005, the City of La Grande invested \$1.5 million in infrastructure to capitalize on the synergy provided by the University, the new Science Center, and potential new businesses and existing business expansion.

Calvin himself has been able to participate in research that could impact salmon harvests in the future, an interest that started in his sophomore year. He and a fellow student developed a research project to determine dangerous pesticide residue levels in steelhead livers as part of a health risk assessment for the Confederated Tribes of Umatilla members who rely on salmon and steelhead as a major food source.

Calvin is proud to have worked with the Oregon Department of Fish and Wildlife captive broodstock program, in which wild Chinook smolt, or young salmon, are captured from three different rivers in Northeast Oregon and the Grande Ronde Basin and taken to the Bonneville Fish Hatchery until they are ready to spawn. Scientists must be able to accurately determine the maturity and gender of the fish in order to know when the fish are ready to spawn. Up until now, they have used ultrasound or invasive techniques to make this determination, but the ultrasound equipment is large and subject to user error.

To better detect maturity status and gender in Chinook salmon, Calvin helped research the use of a noninvasive chemical instrumentation method previously used in the food industry, called short wavelength near infrared spectroscopy. This method allows for a quick, noninvasive, approach and possibly more productive hatcheries down the road.

Meanwhile, Calvin Davis' own road to success is certainly widening as he embarks upon his career, with his Eastern degree in hand and valuable research experience under his belt.

Cutting-Edge Research at a Regional University

SOU professor's research advances the wine industry in Oregon, internationally

Greg Jones, Associate Professor of Geography at Southern Oregon University (SOU), embarked upon a study more than four years ago to help southern Oregon grape-growers better understand the region's potential. Today, vintners as far away as South Africa and France are determining how to incorporate his findings into their own growing methods.

As a climatologist, Jones has analyzed how climate and landscape factors interact with cultural practices in vineyards and wineries.

"Really, this process builds from the idea of precision farming," says Jones. "We are using technology to be more precise about choosing the best site for a given crop. On the one hand, we are providing a measure of ongoing scientific research. On the other hand, we will

be offering growers the opportunity to promote this region, making it more economically viable and possibly attract more growers."

Working with SOU students, Jones developed a model that helps growers match grape varietals to the region's climate and to a site's growing characteristics. Employing a predictive scheme using computer-based geographic information systems (GIS), along with data on climate, topography, soil drainage, pH, water-holding capacity, and depth, the model takes some of the guesswork out of site selection. The results have led Oregon winegrowers to reexamine whether they are growing the best varieties that the climate can ripen. Many new growers are using the model to guide

selection of vineyard sites.

Other research by Jones serves the industry by exploring how climate change impacts grape growth and wine quality. Understanding that grapevines are generally grown in narrow climatic zones – putting them at a greater potential risk from climatic variations – Jones led a research team in studying the effect on wine quality of recent rises in global temperatures

in twenty-seven of the world's top quality wine regions.

Jones's research has brought him from U.S. vineyards to those in Australia, British Columbia, South Africa, Italy, Germany, Spain, and France. In the last six months, he has traveled to Ashland's, Roseburg's, and Medford's sister cities in Mexico (Guanam-

ato), Italy (Alba), and Spain (Aranda de Duero), respectively, where he met each mayor, other researchers, and agricultural representatives. His goals were to learn more from Europe's Old World wine regions that have a similar geography and climate to Southern Oregon, and to share his Oregon-based research.

In addition to wide recognition of his research and scholarship in the science community and wine industry, Jones has brought in over \$600,000 in research funding to SOU for regional studies over the last six years. One of the most internationally engaged faculty members on campus, Jones is both revolutionizing the wine industry and helping a strong niche in the local economy to find fertile ground.



A Virtual Resource for Policymakers and Practitioners

Oregon's competitive advantage - education research

Oregon is fortunate to have very strong education research and development centers at several of its universities, the most well known at the University of Oregon and Western Oregon University (WOU). Respected and sought after nationally, researchers at these centers undertake primary research that advances K-12 teaching effectiveness, educational policy and implementation, and student learning and social behavior, to name a few areas.

Yet, there is little coordination between these centers, and those at other Oregon University System institutions and the other nonprofit, independent education research centers in the state, such as the Northwest Regional Educational Laboratory. Entities seeking help to address issues related to teaching and learning, educational research or policy analysis, do not currently have a single point of contact to seek assistance that would collectively mobilize the excellent resources that exist throughout the state.

Development of a “virtual” research center of all university and nonprofit research work in Oregon – a recom-



mendation of the AEED – would provide a continuity of efforts that would insure regular updates on the state of public Pre-K to 20 education by offering in-depth analyses of critical issues facing education in Oregon. Bringing together and providing access to education-related research in the state would inform policy development and implementation carried out by the legislature, Oregon Department of Education, the State Boards of Education and Higher Education, and other state agencies. Schools, community colleges, and universities also need reliable local research resources that evaluate and inform their assessment, evaluation, program development and improvement efforts.

The Teaching Research Institute at WOU informs and facilitates change in educational and human service systems, through funding of \$6 million a year, 95% of which is from outside sources. The Teaching Research Institute operates two direct service centers: the Education Evaluation Center provides evaluations for children, youth and adults who have disabilities; and the Child Development Center serves children (2-6 years old) of students, faculty and community members. Faculty and staff are engaged in 45+ projects that include research, model development, training, consultation, technical assistance, dissemination and program evaluation in: early childhood education; K-12 education and teacher quality enhancement; special education; deaf-blindness; traumatic brain injury; dispute resolution; urban school improvement; and development and management of state and national data bases.

From Agro to Nano

Transforming Oregon vegetable oils into fuel

Scientists have long sought fuel alternatives to petroleum in order to diversify the world's reliance on this hard to locate, drill, and refine energy source. Exciting and ground breaking research at Oregon State University (OSU) is focused on just this issue, finding alternative crops for Oregon grass seed growers that can be used for production of biodiesel fuel, and at approximately the same cost as a gallon of gasoline. The two-part project first focused on identifying Oregon-grown crops such as mustard seed and rape that can economically allow production of biodiesel fuel. The second part of the project involved developing a biodiesel microreactor that would allow low cost mini biorefineries to be located throughout the Northwest.

With grant funding from the Oregon Tall Fescue Commission, OSU Agricultural Endowment, and Cytec Systems, project researchers – including three graduate students – have demonstrated that biodiesel can be produced in Oregon. Using ONAMI technology to create a biodiesel microreactor significantly decreases the time necessary to produce the biofuel compared to a large refinery, thus furthering the potential to reduce the overall cost of production.

The development of compact processing systems for fuel production from indigenous resources could revolutionize the processing of agricultural products and significantly improve the financial return to the farmer, and ultimately the Oregon economy. Development of nano-modular systems that produce bio-



products and can be economically located throughout the State, rather than in a centralized facility, can substantially reduce costs for transportation of the new vegetable oil-based agricultural products.

While the systems described above are being developed for military applications, all have a strong potential for commercial products. Some of these technologies are within 1 to 3 years of commercialization, resulting in multiple new companies in Oregon with substantial business volume.

From Research to Market

Building infrastructure to bridge the “valley of death”

Taking research from concept to product to market is the focus of the Lab2Market initiative through Portland State University's (PSU) School of Business Administration. This innovative program – which has received almost \$600,000 in multi-year National Science Foundation grants since 2004 – facilitates the commercialization of novel technologies and the creation of high-wage jobs. By forging networks between private sector business expertise and world-class research at Oregon's universities, Lab2Market hopes to have launched twelve new technologies through licensing agreements or start-up ventures at the end of three years.

One aspect of the launch plan is an educational component whereby entrepreneurial thinking is imparted to science and engineering researchers, their staff, and the next-generation of innovators, now students in Oregon high schools. The second component of Lab2Market focuses on a venture-mentoring program, in which MBA students are paired up with mentor teams made up of program partners, including university faculty and students; state, regional and local governments; and the business community (including venture capitalists and Intellectual Property attorneys).

Lab2Market also serves as a proving

ground for innovative policies that lower the barriers university researchers often face in trying to commercialize their work products. These policies address intellectual property development, protection, ownership, and the establishment of mutually beneficial relationships with corporate collaborators. Through this type of focus, a more viable commercialization culture can begin to flourish in the State of Oregon.



Partners in the Lab2Market initiative include PSU (Lead Institution), OHSU, OSU, UO, ONAMI, Pacific Northwest National Laboratory, Oregon Association of Minority Entrepreneurs, Oregon Bioscience

Association, Oregon Entrepreneurs Forum, American Electronics Association, Ecoworks, IBM Healthcare & Life Sciences, Intellectual Assets, Northwest Technology Ventures, OVP Venture Partners, SmartForest Ventures, Davis Wright Tremaine, Stoel Rives, WelchAllyn, Portland Development Commission, Oregon Economic and Community Development Department, Oregon Mathematics Engineering Science Achievement, Saturday Academy, and Upward Bound/Project PLUS.

Acknowledgments

The AEED Working Group extends special thanks and acknowledgment to the following individuals:

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Photos provided by Eastern Oregon University, Oregon Institute of Technology,
Oregon State University, Portland State University, University of Oregon, and
Southern Oregon University

Booklet design: Jason (Beau) Dickey and Charles Triplett

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